PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number:	WO 91/06129
H01M 2/06	A1	(43) International Publication Date:	2 May 1991 (02.05.91)

(21) International Application Number: PCT/US90/05623

(22) International Filing Date: 3 October 1990 (03.10.90)

(30) Priority data:
419,881 11 October 1989 (11.10.89) US

(71) Applicant: MEDTRONIC, INC. [US/US]; 7000 Central Avenue N.E., Minneapolis, MN 55432 (US).

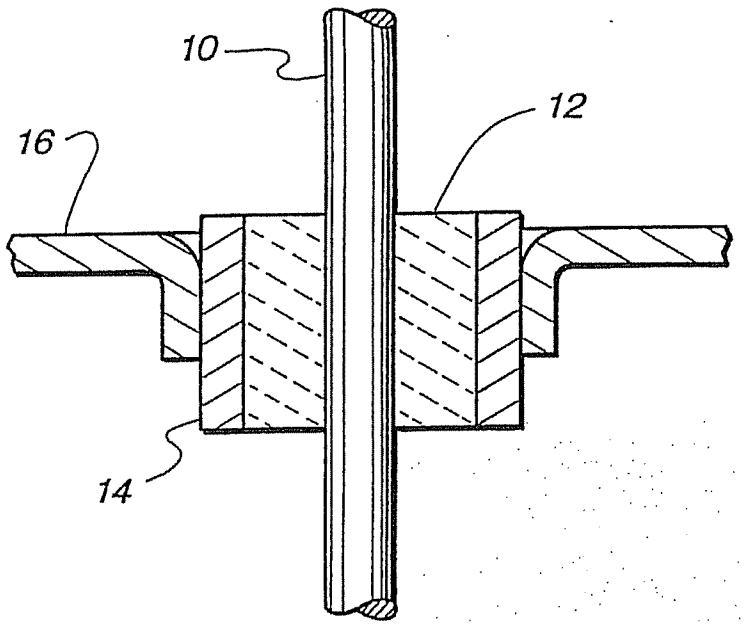
(72) Inventors: TAYLOR, William, John ; 106 Yoho Drive, Anoka, MN 55303 (US). LESSAR, Joseph, Francis ; 3742 114th Lane, N.W., Coon Rapids, MN 55433 (US).

(74) Agents: RISSMAN, John, A. et al.; Medtronic, Inc., 7000 Central Avenue, N.E., Minneapolis, MN 55433 (US).

(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).

Published
With international search report.

(54) Title: CORROSION RESISTANT FEEDTHROUGH



(57) Abstract

Use of Titanium and Titanium alloys (14) in combination with and CABAL-12 glass (12) for improved corrosion resistant feedthroughs.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**ES**	Spain	**MG**	Madagascar
AU	Australia	**FI**	Finland	**ML**	Mali
BB	Barbados	**FR**	France	**MR**	Mauritania
BE	Belgium	**GA**	Gabon	**MW**	Malawi
BF	Burkina Faso	**GB**	United Kingdom	**NL**	Netherlands
BG	Bulgaria	**GR**	Greece	**NO**	Norway
BJ	Benin	**HU**	Hungary	**PL**	Poland
BR	Brazil	**IT**	Italy	**RO**	Romania
CA	Canada	**JP**	Japan	**SD**	Sudan
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SE**	Sweden
CG	Congo			**SN**	Senegal
CH	Switzerland	**KR**	Republic of Korea	**SU**	Soviet Union
CI	Côte d'Ivoire	**LI**	Liechtenstein	**TD**	Chad
CM	Cameroon	**LK**	Sri Lanka	**TG**	Togo
DE	Germany	**LU**	Luxembourg	**US**	United States of America
DK	Denmark	**MC**	Monaco		

CORROSION RESISTANT FEEDTHROUGH

Background of the Invention

Glass seals are used in various arrangements including batteries and other electrochemical cells. For example, in battery headers, glass seals are used to seal the battery container while allowing one or more electrical terminals to extend through the seal for interior/exterior connection thereto. The term "feedthrough" shall be used herein to describe such arrangements in generic fashion.

In batteries and the electrochemical cells, corrosion has been encountered. For example, batteries which include various organic electrolyte systems give rise to corrosion and cracking of glass and metal feedthrough components.

A special glass composition has developed by Sandia National Laboratories which exhibit improved corrosion resistance. It is generally referred to as CABAL-12 glass. Although this glass has desirable corrosion resistance and resistance to cracking, it has been difficult to find metals which will reliably wet the glass to form strong, hermetic seals with it and which work well with respect to the other aspects of seal forming such as weldability, expansion characteristics and so forth. The general purpose of this invention is to provide a combination of metal and CABAL-12 GLASS for improved feedthrough structures in battery and electrochemical cell applications.

Summary of the Invention

This invention relates to feedthrough structures which utilize CABAL-12 glass particularly for use in aggressive battery organic electrolyte environments e.g., a lithium thionyl chloride cell or cells of other active chemistries such as MnO_2, and CFX, for example. It has been discovered that this glass has a unique affinity for sealing to titanium and titanium alloys. In its preferred embodiment the invention relates specifically to hermetic, corrosion resistant, compression-type sealed feedthroughs utilizing single or multiple terminals or pins of niobium, tantalum, molybdenum and titanium or alloy thereof, contained within a header or sleeve of titanium or a titanium alloy, Titanium-6Al-4V being preferred.

Brief Description of the Drawing

Fig. 1 is a schematic cross-section of a battery header in accordance with the invention, and

Fig. 2 is a schematic cross-section of a feedthrough with sleeve according to the invention combined with a metal container for use as an electrochemical cell.

Description of the Preferred Embodiments

While this invention may be embodied in many different forms, there are shown in the drawings and described in detail herein specific preferred embodiments of the invention. The present disclosure is an exemplification of the principles of the invention and is not intended to limit the invention to the particular embodiments illustrated.

Referring to Fig. 1, a header of typical construction is shown which includes a center pin or terminal 10, a glass seal member 12 and an outer member 14. This arrangement and that of Fig. 2 are typical feedthrough seal arrangements which may make use of the

invention. Other arrangements may be used as well and may take any configuration in which the metal is wetted by the glass.

Referring now to the Fig. 2 the invention in a preferred form includes a terminal 10 extending through a glass seal 12 which is received into a sleeve or header 14. Sleeve 14 may be welded into an opening in a battery container 16 of, for example, stainless steel.

The assembly, requiring forming weights, is placed in an oven or furnace and heated causing the glass to wet the metallic components forming a hermetic seal between the glass and the metal components. Such a feedthrough may thereafter be welded if necessary, into any desirable container or the like.

In its preferred form, terminal 10 consists essentially of niobium, or titanium or an alloy thereof. Sleeve 14 is of titanium or a titanium alloy Ti-6A1-4V The glass 12 is CABAL-12, which is of the following composition:

Composition	Wt. M%
Al_2O_3	20
B_2O_3	40
CaO	20
MgO	20

The combination of materials described forms a compression seal which is hermetic and corrosion resistant.

This completes the description of the preferred and alternate embodiments of the invention. Those skilled in the art may recognize other equivalents to the specific embodiments described herein, which equivalents are intended to be encompassed by the claims attached hereto.

Having described the invention, the exclusive rights and privileges thereto are to be defined by the foregoing claims in the light of the foregoing description.

WHAT IS CLAIMED IS:

1. An electrical feedthrough comprising an electrical terminal selected from the group consisting of niobium, tantalum molybdenum, Titanium, titanium alloys, or alloys of any of the foregoing, a glass insulator of the CABAL-12 composition Type positioned around a portion of the terminal and in sealing engagement therewith and a sleeve or header comprised of a titanium or a titanium alloy positioned around a portion of the glass insulator for receiving same in sealing engagement therewith.

2. The feedthrough of Claim 1 in which the sleeve or header titanium alloy is Ti-6Al-4V.

3. A glass/metal feedthrough seal of the compression type including an electrical terminal selected from the group consisting of niobium, tantalum, molybdenum, titanium, titanium alloys or alloys of any of the foregoing; a glass insulator of the CABAL-12 composition type positioned around a portion of the terminal and in sealing engagement therewith and a sleeve or header consisting essentially of titanium or a titanium alloy positioned around a portion of the glass insulator for receiving same in sealing engagement therewith.

4. The feedthrough of Claim 3 in which the titanium alloy is Ti-6Al-4V.

5. An electrochemical cell of the type including corrosive contents in a container and wherein the container includes an opening carrying an electrical terminal which extends from the exterior of the cell through the opening and into the interior thereof; a feedthrough assembly positioned in the opening and around the terminal, the assembly comprising; a sleeve or header attached to the container, the sleeve or header consisting essentially of titanium or a titanium alloy

and a glass seal carried by the sleeve or header and surrounding the terminal in sealing engagement therewith, the glass being of the CABAL-12 composition type.

6. The cell of Claim 5 in which the feedthrough seal is hermetic and of the compression type by virtue of including a terminal of niobium, tantalum, molybdenum, titanium, a titanium alloy or any alloy or any of the foregoing.

Fig. 1

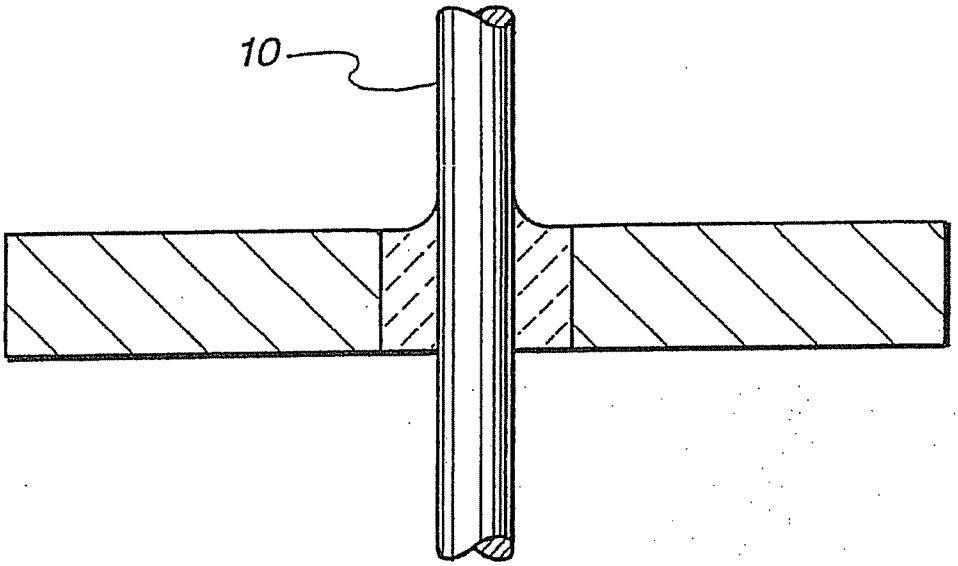
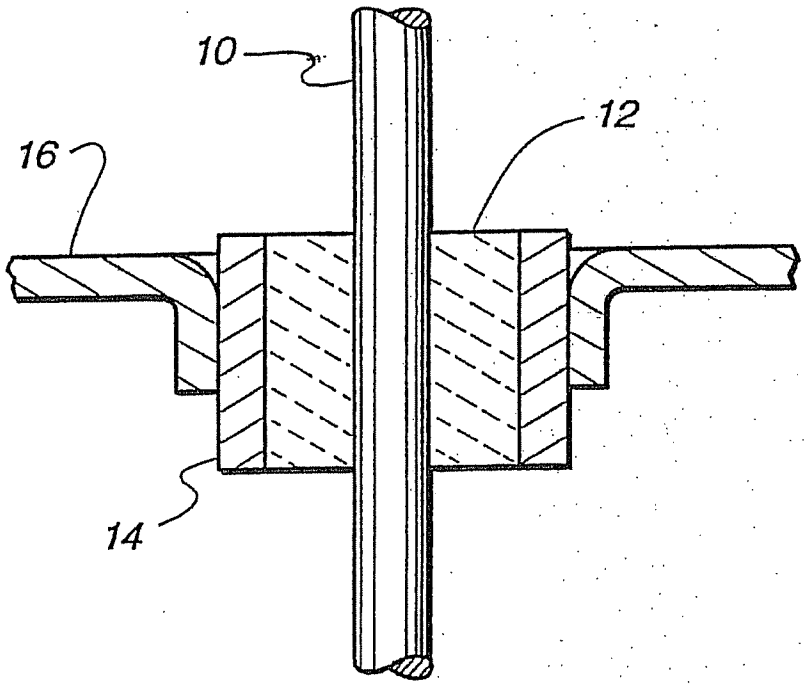


Fig. 2 V



INTERNATIONAL SEARCH REPORT

International Application No PCT/US90/05623

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

INT(5): H01M 2/06 US CL.: 429/181

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
US	429/181 174/152GM, 50, 61

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
Y	US, A, 4,421,947 (KYLE) 20 December 1983 Col. 6, lines 21-32.	1-6
Y	US, A, 455,613 (TAYLOR ET AL.) 03 December 1985 Cols. 4 and 5, lines 62-100.	1-6
A	US, A, 4,180,700 (KRASKA ET AL.) 25 December 1979	
A	US, A, 4,271,278 (PHILLIPS ET AL.) 02 June 1981	
A	US, A, 4,307,162 (ATHEARN) 22 December 1981	
A	US, A, 4,678,868 (KRASKA ET AL.) 07 July 1987	
A	EP, A, 269,007 (HUBNER) 01 June 1988	
A	US, N, (RHEE) Wetting of Ceramics by Liquid Metal, Journal of the American Ceramic Society, pages 332-334, Vol. 54, No. 7.	
A	US, A, (BUNKER ET AL.) Development of Corrosion Resistant Glasses for Ambient Temperature Lithium Batteries, Sandia National Laboratories, 02 December 1981, pages 1-7.	
A	US, N, (BUNKER ET AL.) Ampule Tests to Simulate Glass Corosion in Ambient Temperature Lithium Batteries, Vol. 2, Sandia Report SAND83-230½, June 1984.	

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
12 DECEMBER 1990	05 FEB 1991
International Searching Authority [1]	Signature of Authorized Officer [20]
ISA/US	DONALD L. WALTON